

PAPER • OPEN ACCESS

An electronic environment of higher education institution (on the example of Zhytomyr Polytechnic State University)

To cite this article: A V Morozov and T A Vakaliuk 2021 *J. Phys.: Conf. Ser.* **1840** 012061

View the [article online](#) for updates and enhancements.



240th ECS Meeting ORLANDO, FL

Orange County Convention Center Oct 10-14, 2021



Abstract submission due: April 9

SUBMIT NOW

An electronic environment of higher education institution (on the example of Zhytomyr Polytechnic State University)

A V Morozov and T A Vakaliuk

Zhytomyr Polytechnic State University, 103 Chudnivska Str., Zhytomyr, 10005,
Ukraine

E-mail: tetianavakaliuk@gmail.com

Abstract. The article considers the expediency of developing and using the electronic environment of a higher education institution. It was found that the existence of such an electronic environment of a higher education institution would allow us to effectively use the available resources of higher education. A model of the electronic environment of a higher education institution is proposed, which consists of 4 components: educational, scientific, organizational, and managerial. The structural elements of each of the components are described. An example of the implementation of such an electronic environment on the example of the Zhytomyr Polytechnic State University is considered. The personal offices of the student and the teacher, which are realized according to the given model at the Zhytomyr Polytechnic State University, are considered in detail. It is established that the indisputable advantage is the complete identification of the person who went to different parts of such an environment, another advantage is the integrated use of logins and passwords to all these components.

1. Introduction

Recently, higher education institutions (HEI) have been paying attention to the development and implementation of various electronic systems and environments for the automation of management and educational activities, including document management systems. At the same time, the complexity of the unique identity of the subject of the educational process in different systems leads to some confusion and the difficulty in exchanging data between them.

The existence of this electronic medium institution of higher education would allow effective use of available resources HEI.

2. Theoretical background

The issues of management of different educational systems were considered by Eva Huang [12], Apostolos Koutropoulos [18], Iryna S. Mintii [27], and others. At the same time, the informatization of education was covered by Olga V. Bondarenko [1], Oleksandr Yu. Burov [3], Andrii M. Hurzhii [6], Anna V. Iatsyshyn [14], Alla M. Kolomiiets [23], Mariia P. Leshchenko [24], Yevhenii O. Modlo [28], Nadiia S. Ponomareva [35], Serhiy O. Semerikov [29], Oleg M. Spirin [45], Aleksander V. Spivakovskiy [40], Illia O. Teplytskyi [38], Yurii V. Tryus [42], Vladyslav Ye. Velychko [8], Myroslav I. Zhaldak [48], and others. The design and use of educational environments have been studied by Dmytro S. Antoniuk [46], Roman M. Horbatiuk [10], Olena O. Lavrentieva [22], Alona T. Litvinchuk [20], Maiia V. Marienko [26], Olga P. Pinchuk [33], Kateryna I. Slovak [21], Vladimir N. Soloviev [17], Stanislav T. Tolmachev [32], Snizhana O. Zelinska [47] and others.



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

In particular, Valeriy G. Hrytsenko in his work HEI as an object of management considers “as a formal structure, the main elements of which are the participants in the educational process” ([11], p. 48). As a result, the researcher claims that the management of free economic education means “management of the participants of the educational process (research and teaching staff, teaching and support staff, doctoral students, graduate students, students, etc.)” ([11], p. 48).

Valerii Yu. Bykov and Mariya P. Shyshkina considers the current problems of in-service education and training of skilled personnel for high-tech industries in Ukraine [4], also the researcher investigates the theoretical approaches to developing computer tools for organizing and supporting cognition, learning and teaching in Eastern European countries [5]. Yurii V. Tryus and Inna V. Herasymenko substantiates the necessity and expediency of using the dual form of education in training specialists in the field of information technology in technical universities of Ukraine [43]. The effectiveness of GitHub cloud services for implementing a programming training project is also considered by Olena G. Glazunova [9], Svitlana H. Lytvynova offers for consideration a cloud-oriented learning environment of secondary school [25], and considers the possibilities of Web-based education of computer science bachelors in higher education institutions [37].

The information and educational environment of the institution of higher education is also studied by Vasyl P. Oleksyuk [30], Liubov F. Panchenko [31], Andrii M. Striuk [41].

Mariya P. Shyshkina explores promising learning technique of the cloud technologies use for students collaboration support [36], as well as the technologies of distance learning on the principles of integrated development of key competences [39]. Anna V. Iatsyshyn considers various aspects of the use of ICT in higher education ([19], [13]).

That is why the article aims to describe the possibilities of the electronic environment of higher education institutions (on the example of Zhytomyr Polytechnic State University).

3. Results

Currently, various higher education institutions either use self-developed systems or purchased from popular developers.

In particular, the most common in the use of management systems of the educational process among higher education institutions of Ukraine is “Directive” [16], “University” [44], “Polytech-software” [34]. There are also higher education institutions that use their developments: the Borys Grinchenko Kyiv University (see figure 1) [2], Khmelnytsky National University (see figure 2) [15].

In particular, Borys Grinchenko Kyiv University offers access to its various components from the main page of the university (with some restrictions – some resources are available only from the internal network), in turn, Khmelnytsky National University presents this environment as a list of links to necessary materials.

Therefore, it was decided to develop an electronic environment of the university, which could be used in modern conditions. As a result, there was a problem to develop a model of the electronic environment of higher education, as well as to describe the functions of each component of this model.

The proposed model consists of 4 components: educational, scientific, organizational, and managerial (see figure 3).

First, consider the organizational component, which involves the administration of the entire electronic environment of higher education. The administrator manages the roles, distribution of user access rights. In turn, its actions involve not only the establishment of certain restrictions but also the definition of rules for the establishment of roles. As a result, all employees of the higher education institution have one login and password, which gives access to personal accounts of users (teachers, students, teaching staff, management of departments, administrator), the internal network of the higher education institution, corporate mail, and to the educational portal where semester training (LMS Moodle) is carried out.

This provides unambiguous identification of the subject of the educational process in the various components of the electronic environment of the university.

Excursion to the main e-resources of Grinchenko University

Available from external network:



Figure 1. E-environment of Borys Grinchenko Kyiv University.

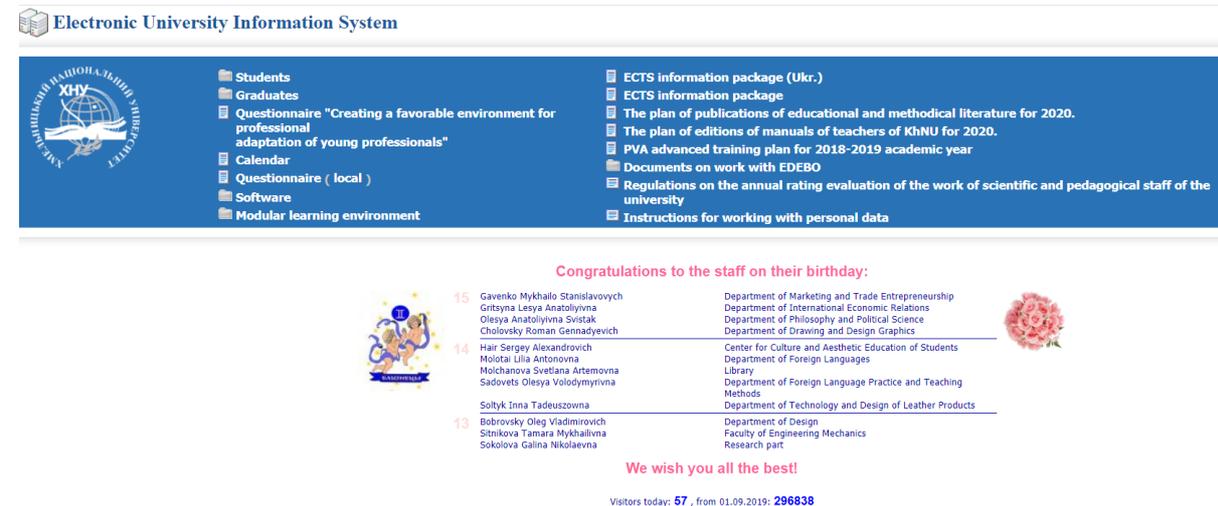


Figure 2. Information system “Electronic University” of Khmelnytsky National University.

In addition, the organizational component provides a clear structure of the institution of higher education with all its departments, as well as maintaining a single calendar of events of all structural units of the university in one place.

The next – the management component involves the separation of heads of all departments of the university and, accordingly, their areas of work.

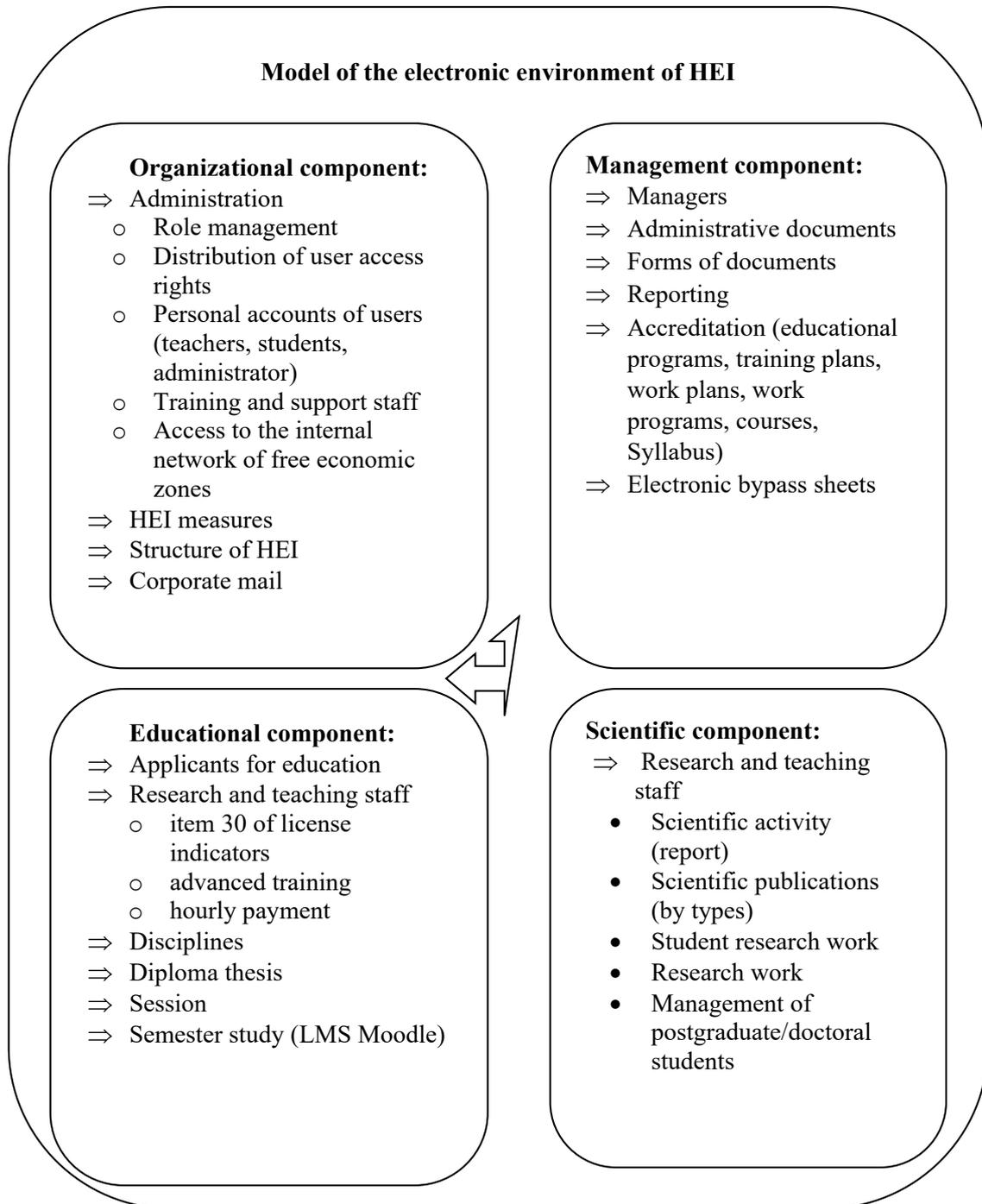


Figure 3. Model of the electronic environment of HEI.

This component provides for the maintenance of administrative documents, the provision of generally accepted forms of certain documents for all structural units of higher education. In addition, an integral part of this component is the formation of reports on various parameters.

Also in the light of new requirements for accreditation, it is advisable to separate and document for accreditation in each speciality (educational programs, curricula, work plans, work programs of

disciplines, syllabuses). After all, such material should be available to all participants in the educational process.

The educational component, in turn, is implemented in the following areas.

1. Applicants: information on each higher education applicant, registration on the only professional exam, relevant statistics, lists of applicants by groups, group management, and information on tuition fees.

2. Scientific and pedagogical workers: fulfillment of item 30 of license indicators, advanced training, hourly payment.

3. Academic disciplines

4. Diploma thesis

5. Session: information on the admission of students to the test or exam, information for research and teaching staff (open and closed), information on individual groups, and summary information.

6. Semester training, which is carried out through the learning management system Moodle.

In addition, of course, the scientific component, which contains the following elements for research and teaching staff: report on scientific activities, scientific publications (by type), student research, research, and guidance of graduate / doctoral students.

Consider in detail the personal offices of students and teachers, which are implemented according to the above model at the Zhytomyr Polytechnic State University.

3.1. Student's account

The student in his account [49] (see figure 4) (<https://cabinet.ztu.edu.ua/>, logging in with his login and password) can see information about training (faculty, educational level, a form of study, group number, specialty, and educational program), information on tuition fees for students studying at the expense of individuals and legal entities and dormitory payment information (payment status for the current month, amount per month, student serial number, details for payment, and the ability to download a payment receipt).

The screenshot displays the student's personal office interface. At the top, there is a navigation bar with 'Home' and 'Log out (kik_vta)'. The main content is divided into three sections:

- Training information:** A table with fields: Name (Vakalyuk Tetyana Anatoliivna), Faculty (Faculty of Information and Computer Technologies), Educational degree (Master), Form of study (Correspondence), Group (ZIPZmh-19-1), Specialty (121 Software Engineering), and Educational program (Software engineering).
- Test and examination session:** A table listing exam results:

Agile and project management	exam 06.06.2020 11:40	100 A is excellent
Data mining languages	offset 08.06.2020 13:30	100 A credited
Cloud technologies and IoT	exam 09.06.2020 13:30	95 A excellent
Technologies of administration and protection of information systems	exam 10.06.2020 13:30	91 A excellent
- Information on tuition fees:** A table with fields: Status (paid), Amount per month (1440 UAH), Sequence number (37466), Details for payment (Payer: Vakalyuk Tetyana Anatoliivna, Recipient: Zhytomyr Polytechnic State University, Bank: SC SU in Kyiv, Account: UA708201720313241001201000321, Code: 05407870, Purpose of payment: For training. Name: Vakalyuk Tetyana Anatoliivna, ordinal №37466, message №792820), and Receipt for payment (Months: 1, Amount: 1440 hryvnias, Download).

Figure 4. Personal office of the student in the electronic environment of Zhytomyr Polytechnic State University.

Also, in the student's account, there is a section “Credit-examination session”, where students following the “Regulations on the assessment of students' knowledge in terms of a credit-module system of the educational process” Zhytomyr Polytechnic [7] can agree with the assessment he received during the semester (if it is 60 points or more), or go to the test/exam – if the student scored 50 or more points, but he is not satisfied with his assessment.

To connect to the test/exam, it is possible to connect to the zoom conference and take the appropriate subject.

In this case, if the student agreed to the assessment, the cell with the assessment is painted green. After closing the information on the day of the exam or exam, the student and teacher are no longer able to edit this grade.

Also, the student with the same login and password has the opportunity to enter the corporate mail, the internal network of the university, and the educational portal, where the semester training (LMS Moodle), which is located at <https://learn.ztu.edu.ua/> [51] (see figure 5). This portal contains all the materials necessary for semester study, as well as which do are necessary for the implementation of educational activities.

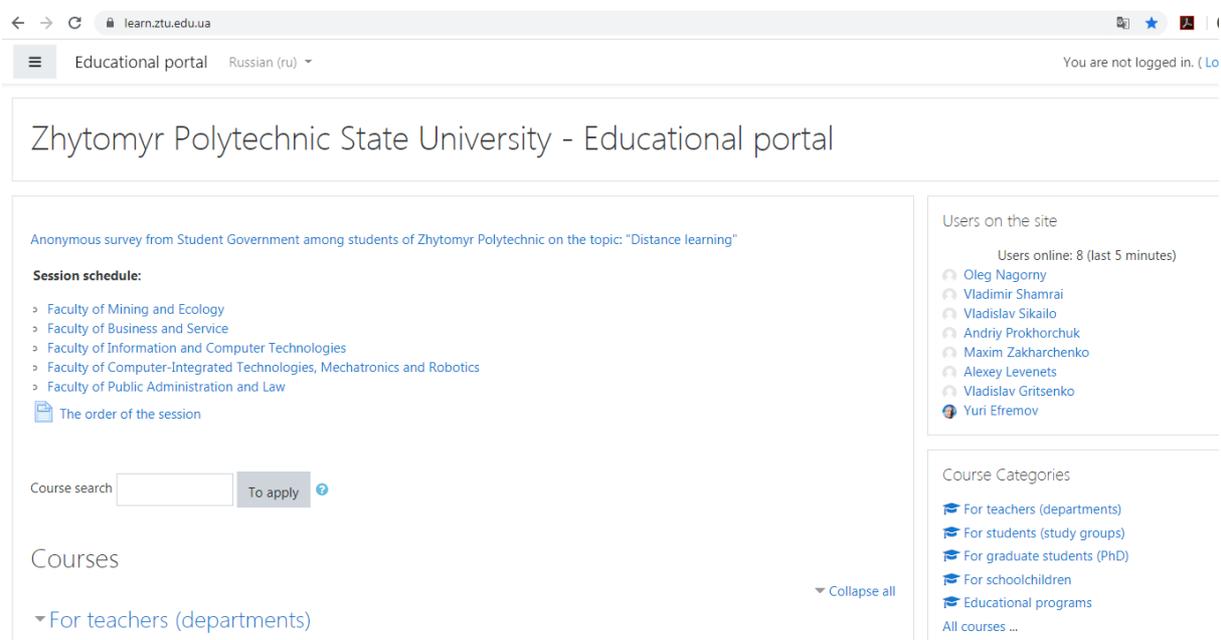


Figure 5. The educational portal of Zhytomyr Polytechnic State University.

3.2. Personal office of the scientific and pedagogical worker

Researchers with the help of their unique login and password can similarly enter all these structural elements of such an environment. To enter the personal account [50], researchers need to use the link <https://portal.ztu.edu.ua/> and your login and password.

In this personal account, the teacher has the opportunity to work with the following elements: university events, students, the educational process, the teacher's profile, and the session (see figure 6).

The “University Events” section includes the ability to add an event (both at the structural unit and at university level), view the calendar of events, the list of events, and the ability to edit events (see figure 7). This is convenient for organizing meetings at different levels (from the meeting of the department to the rector).

The section “Applicants” contains a list of applicants by groups (see figure 8). You can browse or search for applicants by faculties, forms of education, educational degree, specialty, etc. This section is designed to record all students in different forms of education.

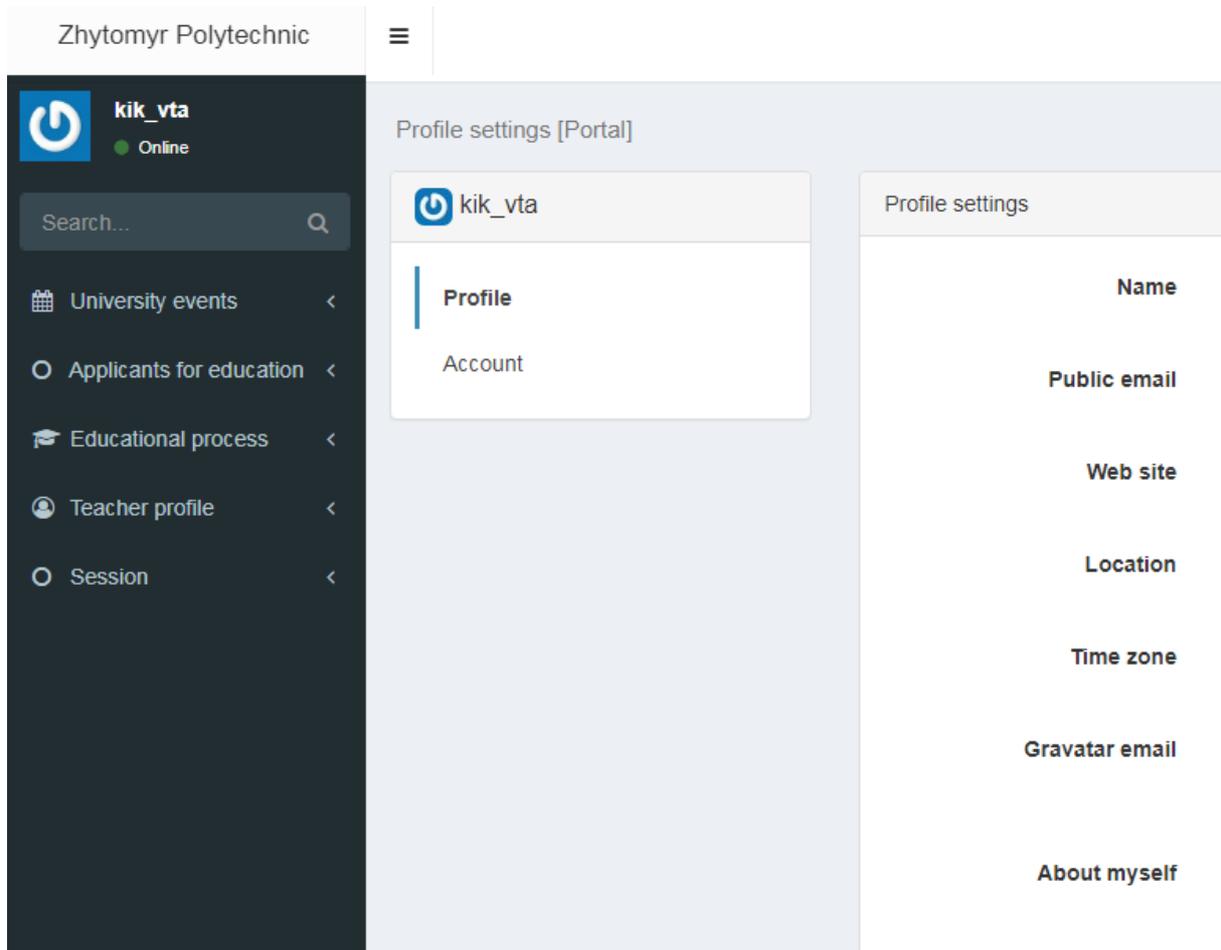


Figure 6. Personal office of research and pedagogical worker in the electronic environment of Zhytomyr Polytechnic State University.

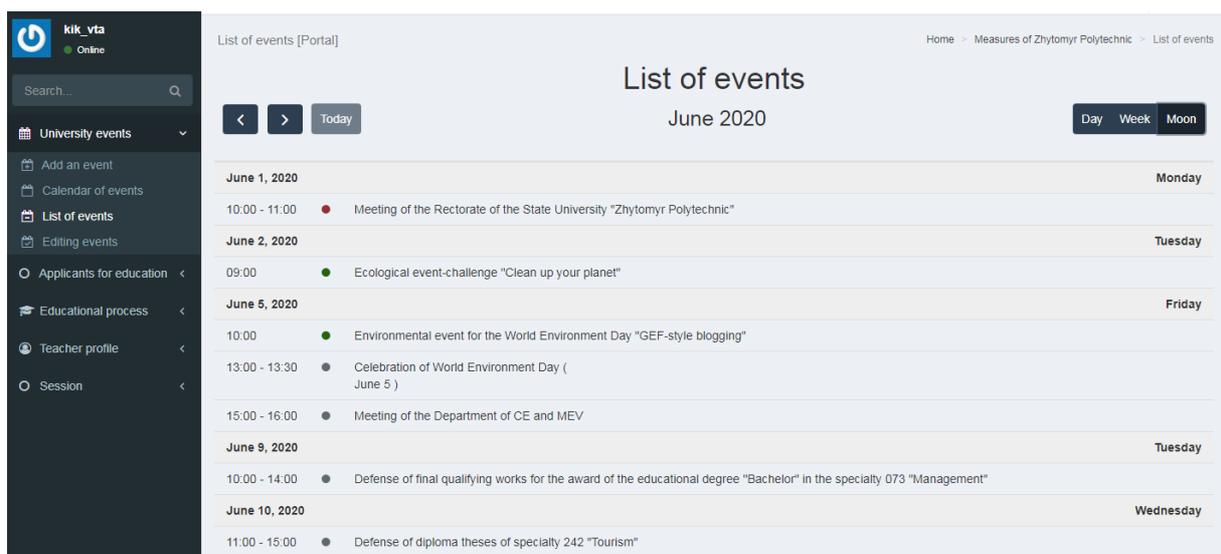


Figure 7. University events in the electronic environment of Zhytomyr Polytechnic State University.

Academic groups [Portal] Home > Applicants for education > Academic groups

Academic groups

Academic groups Showing 1-20 of 313 records.

#	ID	Group name	Course	Number of students	Faculty	Form of study	Educational degree	Specialty	Educational
1	1	GG-24	4	24	GEF	Day	Bachelor	184 Mining	Mining
2	2	GG-25k	3	3	GEF	Day	Bachelor	184 Mining	Mining
3	3	EC-36	4	6	GEF	Day	Bachelor	101 Ecology	Ecology
4	4	ZGG-17-K	3	4	GEF	Correspondence	Bachelor	184 Mining	Mining
5	5	ZEO-16-1	4	12	GEF	Correspondence	Bachelor	101 Ecology	Ecology
6	6	ZEO-17-K	3	12	GEF	Correspondence	Bachelor	101 Ecology	Ecology
7	7	ZRR-16-1	4	11	GEF	Correspondence	Bachelor	184 Mining	Mining

Figure 8. An example of an intellectual map for learning foreign languages, created by students during a distance-learning course.

The section “Educational process” contains a repository of forms (see figure 9), which are necessary and standard for all departments of the university. This section currently contains the following forms:

1. Form of the order on personnel issues (personnel).
2. The form of the order on the main activity or administrative and economic issues.
3. Protocol form.
4. Form of the dean's order.

Album forms

Album forms Showing 1-4 of 4 records.

#	ID	Document name	Category
1	1	Form of the order on personnel questions (personnel)	General documents
2	2	The form of the order on the main activity or administrative and economic issues	General documents
3	3	Protocol form	General documents
4	4	Dean's order form	General documents

Figure 9. Album forms.

This section will be constantly updated, currently; the educational and methodical department is developing such forms.

In the teacher's profile, we have: a list of personal scientific publications, add a publication (both your own and any other employee), review the profile, training, implementation of paragraph 30 of the license indicators, and scientific activities (see figure 10).

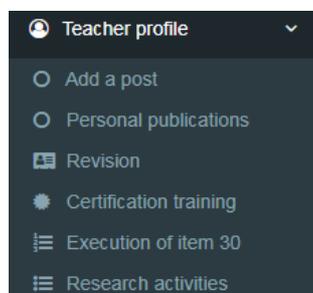


Figure 10. Teacher profile.

In the list of publications, you can view all the scientific papers included in the database, with any of the scientific and pedagogical staff. Publications can be viewed by year of publication, as well as by type of publication (see figure 11). To add a publication, you need to click the “Add publication” button and fill in all the appropriate fields (see figure 12). In your profile, you can view all the data that were entered in this section (see figure 13). The advantage of this environment is that all teachers have a complete list of the implementation of paragraph 30 of the license indicators (see figure 13).

Posts added by me

[Add a post](#)

Posts that are entered with errors are highlighted in red! If you have such publications in your list, please double-check that you entered the information correctly

We also draw your attention to the fact that when making it is necessary to note all the authors of the publication, including yourself!

Posts added by me Showing 1-20 of 150 records.

#	ID	Year of publication	Complete publication data	Type	I added
1	802	2019	Vakalyuk TA, Korotun OV, Antonyuk DS Selection of cloud-based means of training databases of future specialists in information technology [Electronic resource]. Information technologies and teaching aids. 2019. № 3 (71). Pp. 154-168. URL: https://journal.iitta.gov.ua/index.php/itit/article/view/2880/1502	Article in a magazine published in Ukraine	Vakalyuk Tetyana Anatoliivna
2	803	2019	Spirin OM, Vakalyuk TA Formation of information and communication competence of bachelors of informatics on the use of cloud-based learning environment [Electronic resource]. Information technologies and teaching aids. 2019. № 4 (72). Pp. 226-245. URL: https://journal.iitta.gov.ua/index.php/itit/article/view/3262	Article in a magazine published in Ukraine	Vakalyuk Tetyana Anatoliivna
3	807	2019	Information technologies in higher school: Monograph / [Antonyuk DS, Boychuk ID, Bolotina VV, Bolukh VA, Vakalyuk TA, Zhmurko OI, Kontsedaylo VV, Korotun OV, Litvinova SG, Marienko MV, Mahometta TM, Medvedeva MO, Mintiv IS, Mintiv MM, Mishchenko OA, Osova OO	Monograph	Vakalyuk Tetyana Anatoliivna

Figure 11. Publications of teachers.

The item “Advanced training” contains the names of disciplines and the number of lecture hours in each of them, which are taught in the current academic year at the State University “Zhytomyr Polytechnic”, the name of the institution where the training took place, the topic of training, type of training document, number of the document on professional development and date of issue.

Add a publication

Year of publication

Year

Type of publication

Select the type of publication

Name

Name

Name of the magazine / publication

The name of the magazine or publication

Number of pages

Number of pages

Home page

Home page

End page

End page

Link to the electronic version

Link to the electronic version

Figure 12. Adding a publication.

Vakalyuk Tetyana Anatoliivna [Portal] Home > Teacher profile > Vakalyuk Tetyana Anatoliivna

Research and teaching staff: Vakalyuk Tetyana Anatoliivna

Last name, first name and patronymic	Vakalyuk Tetyana Anatoliivna
Position	professor
Chair	Department of Software Engineering
User	Vakalyuk Tetyana Anatoliivna
Full-time position or part-time	The main place of work

Compliance with clause 30 of the License Terms [Edit](#)

1) Availability for the last five years of scientific publications in periodicals that are included in the scientometric databases recommended by the Ministry of Education and Science, in particular Scopus or Web of Science Core Collection

- Kontsedaylo VV Criteria for the selection of game simulators for the formation of professional competencies of future software engineers [Electronic resource] / VV Kontsedaylo, TA Vakalyuk // Information technologies and teaching aids. - 2018. № 3 (65). Pp. 133-151. URL: <https://journal.iitta.gov.ua/index.php/itit/article/view/2039/1347> (WoS)
- Карплюк С.О. Review of functional possibilities of software for management of educational process of institution of higher education [Electronic resource] / SO Karplyuk, TA Vakalvuk // Information technologies and means of training. - 2018. № 3 (65). Pp. 262-276. URL: <https://journal.iitta.gov.ua/index.php/itit/article/view/1961/1341> (WoS)

Figure 13. Data on teachers in the section “Teacher's profile”.

“Scientific activity” includes the following information: the main publications in the speciality of the teacher, research work, participation in conferences and seminars, work with graduate and doctoral students, the guidance of scientific work of students.

No less important is the section “Session”, where the teacher has access to electronic information, where he can put grades for each subject (see figure 14). Information is divided into open and closed. Open information is available from the end of the semester until the day of the credit/exam. Closed information is information that has expired (information is moved from open to close the day after delivery) (see figure 15).

Open performance records

#	ID	Status	Fill check	Date of semester control	Start time	Academic group	Number of students	Estimates	Academic discipline	Form of control	Structural unit	Semester
Nothing found.												

Figure 14. Session. Open performance records.

Closed performance records

#	ID	Status	Fill check	Date of semester control	Start time	Academic group	Number of students	Estimates	Academic discipline	Form of control	Structural unit	Semester
1	666	OK	OK	06/03/2020	11:40	EC-3	10	10	Digitization of document management and e-office	credit	FBSO	2019/2020 n.r. 2nd semester
2	928	OK	OK	06/05/2020	13:30	PL-1	17	17	Application packages	exam	ФПУП	2019/2020 n.r. 2nd semester
3	929	OK	OK	06/05/2020	13:30	PL-2	17	17	Application packages	exam	ФПУП	2019/2020 n.r. 2nd semester

Figure 15. Session. Closed performance records.

At the time of grading, you only need to set a score in the 100-point system; everything else is filled in automatically by the system. If the student agrees with the grade – the cell is highlighted in green, if not – yellow. If the cell is white – the student either has not yet confirmed or has not scored the required minimum for admission to the form of control (see figure 16). If the student took the test – under the appropriate cell in red will be marked for the test, which the teacher must transfer to the appropriate cell.

4. Conclusion

As the experience of Zhytomyr Polytechnic State University staff shows, the use of such an electronic environment of a higher education institution is not only convenient but also useful. An indisputable advantage is the complete identification of a person who has entered different parts of such an environment; another advantage is the integrated use of logins and passwords to all these components.

Faculty of Public Administration and Law

Form of study: **Day**
 Educational degree: **Bachelor**
 Specialty: **035 Philology**
 Educational program: **Philology (Applied Linguistics)**

Group: **PL-2**
 Course: **1**
 Academic year: **2019/2020**
 Semester: **2**

SUCCESS ACCOUNTING STATEMENT № 87/20 dated 18.05.2020

Application packages
 form of control: **exam** , number of credits: 3
 date: **05.06.2020** , start time: 13:30
 scientific and pedagogical workers: **Vakalyuk Tetyana Anatoliivna**

Group: PL-2

Legend:
The student takes a test / exam
The student agreed with the assessment

Nen / n	Surname, name and patronymic of the student	100-point rating	ECTS	On a national scale	Date	NPP
1	Bondarchuk Ruslana Ruslanivna	39	FX	unsatisfactorily	27.05.2020 23:38	Vakalyuk Tetyana Anatoliivna
2	Vencheslavskva Olga Vladimirovna	62	E	satisfactorily	05/29/2020 16:53	Vakalyuk Tetyana Anatoliivna
3	Voznyuk Dmitry Pavlovich	56 Test: 56	FX	unsatisfactorily	05.06.2020 15:17	Vakalyuk Tetyana Anatoliivna
4	Grigorchuk Yana Viktorivna	62	E	satisfactorily	05/29/2020 10:12 AM	Vakalyuk Tetyana Anatoliivna
5	Zalizniak Maria Andreevna	86	B	okay	25.05.2020 13:27	Vakalyuk Tetyana Anatoliivna

Figure 16. Type of completed performance records.

The promising areas of research include the definition of criteria and indicators of the effectiveness of such an electronic environment of free economic zones and, accordingly, the application of the method of expert evaluation according to certain criteria and indicators.

References

[1] Bondarenko O V, Pakhomova O V and Lewoniewski W 2020 The didactic potential of virtual information educational environment as a tool of geography students training *CEUR Workshop Proceedings* **2547** 13–23

[2] Borys Grinchenko Kyiv University 2020 *E-environment* URL <https://kubg.edu.ua/resursi/%D0%B5-%D1%81%D0%B5%D1%80%D0%B5%D0%B4%D0%BE%D0%B2%D0%B8%D1%89%D0%B5/rusursi.html>

[3] Burov O Yu, Kiv A E, Semerikov S O, Striuk A M, Striuk M I, Kolgatina L S and Oliynyk I V 2020 AREdu 2020 – How augmented reality helps during the coronavirus pandemic *CEUR Workshop Proceedings* **2731** 1–46

[4] Bykov V and Shyshkina M 2014 Emerging technologies for personnel training for IT industry in Ukraine *Proceedings of 2014 International Conference on Interactive Collaborative Learning, ICL 2014* pp 945–949 7017903

[5] Bykov V, Dovgiallo A and Kommers P A M 2001 Theoretical backgrounds of educational and training technology *International Journal of Continuing Engineering Education and Life-Long Learning* **11** 412–41

[6] Bykov V, Gurzhiy A and Kozlakova G 1994 Development of computer education in Ukrainian

- higher technical schools *IFIP Transactions A: Computer Science and Technology* (A-52) pp 678–81
- [7] Documents of Zhytomyr Polytechnic 2019 *Regulations on the assessment of students' knowledge in the conditions of the credit-modular system of organization of the educational process of the Zhytomyr Polytechnic State University* URL <https://docs.ztu.edu.ua/mdocs-posts/polozhennya-pro-otsinyuvannya-znan-studentiv-v-umovah-kredytno-modulnoyi-systemy-organizatsiyi-navchalnogo-protsesu/>
- [8] Fedorenko E H, Velychko V Ye, Stopkin A V, Chorna A V and Soloviev V N 2019 Informatization of education as a pledge of the existence and development of a modern higher education *CEUR Workshop Proceedings* **2433** 20–32
- [9] Glazunova O G, Parhomenko O V, Korolchuk V I and Voloshyna T V 2021 The effectiveness of GitHub cloud services for implementing a programming training project: students' point of view *Journal of Physics: Conference Series* In press
- [10] Horbatiuk R M, Bilan N M, Sitkar O A and Tymoshchuk O S 2021 The formation of educational environment in foreign language training of energy engineering students by means of project technology *Journal of Physics: Conference Series* In press
- [11] Hrytsenko V G 2019 Theoretical and methodological bases of design and implementation of the information-analytical system of university management *Thesis* URL <https://lib.iitta.gov.ua/716633/>
- [12] Huang E, Benson J and Zhu Y 2016 *Teacher management in China: The transformation of educational systems* (London: Routledge) URL <https://doi.org/10.4324/9781315693040>
- [13] Iatsyshyn A V, Kovach V O, Romanenko Ye O and Iatsyshyn A V 2019 Cloud services application ways for preparation of future PhD *CEUR Workshop Proceedings* **2433** 197–216
- [14] Iatsyshyn Anna V, Popov O O, Kovach V O, Iatsyshyn Andrii V, Artemchuk V O, Radchenko O O, Deinega I I and Kovalenko V V 2021 Formation of the scientist image in modern conditions of digital society transformation *Journal of Physics: Conference Series* In press
- [15] Khmelnytsky National University 2020 *Information system "Electronic University"* URL <https://isu1.khnu.km.ua/isu/>
- [16] Kitsoft 2021 *IT for government and business* URL <https://www.kitsoft.kiev.ua/en/>
- [17] Korotun O V, Vakaliuk T A and Soloviev V N 2020 Model of using cloud-based environment in training databases of future IT specialists *CEUR Workshop Proceedings* **2643** 281–92
- [18] Koutropoulos A 2013 Learning management system evaluation and selection: A case study of the university of massachusetts system methodology for the learning platform review *Learning Management Systems and Instructional Design: Best Practices in Online Education* (Hershey: IGI Global) ed Kats Y pp 20–39 URL <https://doi.org/10.4018/978-1-4666-3930-0.ch002>
- [19] Kovach V, Deinega I, Iatsyshyn A, Iatsyshyn A, Kovalenko V and Buriachok V 2019 Electronic Social Networks as Supporting Means of Educational Process in Higher Education Institutions *CEUR Workshop Proceedings* **2588** 418–33
- [20] Kupchyk L and Litvinchuk A 2021 Constructing personal learning environments through ICT-mediated foreign language instruction *Journal of Physics: Conference Series* In press
- [21] Kyslova M A, Semerikov S O and Slovak K I 2014 Development of mobile learning environment as a problem of the theory and methods of use of information and communication technologies in education *Information Technologies and Learning Tools* **42** 1–19 URL <https://doi.org/10.33407/itlt.v42i4.1104>
- [22] Lavrentieva O, Horbatiuk R, Skripnik L, Kuchma O, Penia V and Pahuta M 2021 Theoretical and methodological bases of designing the educational institution information and consulting environment *Journal of Physics: Conference Series* In press
- [23] Leshchenko M P, Kolomiiets A M, Iatsyshyn A V, Kovalenko V V, Dakal A V and Radchenko O O 2021 Development of informational and research competence of postgraduate and doctoral students in conditions of digital transformation of science and education *Journal of*

Physics: Conference Series In press

- [24] Leshchenko M, Hrynko V and Kosheliev O 2020 Methods of Designing Digital Learning Technologies for Developing Primary School Pre-Service Teachers' 21st Century Skills *CEUR Workshop Proceedings* **2732** 1028–43
- [25] Lytvynova S H 2018 Cloud-oriented learning environment of secondary school *CEUR Workshop Proceedings* **2168** 7–12
- [26] Merzlykin P V, Popel M V and Shokaliuk S V 2018 Services of SageMathCloud environment and their didactic potential in learning of informatics and mathematical disciplines *CEUR Workshop Proceedings* **2168** 13–9
- [27] Mintii I S 2020 Using Learning Content Management System Moodle in Kryvyi Rih State Pedagogical University educational process *CEUR Workshop Proceedings* **2643** 293–305
- [28] Modlo Ye O and Semerikov S O 2018 Xcos on Web as a promising learning tool for Bachelor's of Electromechanics modeling of technical objects *CEUR Workshop Proceedings* **2168** 34–41
- [29] Nechypurenko P P and Semerikov S O 2017 VlabEmbed – the New Plugin Moodle for the Chemistry Education *CEUR Workshop Proceedings* **1844** 319–26
- [30] Oleksyuk V P 2013 Experience of the integration of cloud services Google Apps into information and educational space of higher educational institution *Information Technologies and Learning Tools* **35** 64–73 URL <https://doi.org/10.33407/itlt.v35i3.824>
- [31] Panchenko L and Khomiak A 2020 Education Statistics: Looking for a Case-study for Modelling *CEUR Workshop Proceedings* **2732** 948–63
- [32] Pererva V V, Lavrentieva O O, Lakomova O I, Zavalniuk O S and Tolmachev S T 2020 The technique of the use of Virtual Learning Environment in the process of organizing the future teachers' terminological work by specialty *CEUR Workshop Proceedings* **2643** 321–46
- [33] Pinchuk O P, Sokolyuk O M, Burov O Yu and Shyshkina M P 2019 Digital transformation of learning environment: aspect of cognitive activity of students *CEUR Workshop Proceedings* **2433** 90–101
- [34] Polytech-SOFT 2021 *Software for higher educational institutions of Ukraine* URL <http://www.politek-soft.kiev.ua>
- [35] Ponomareva N S 2021 Role and place of Informatics in the training of future teachers of mathematics *Journal of Physics: Conference Series* In press
- [36] Popel M V, Shokalyuk S V and Shyshkina M P 2017 The Learning Technique of the SageMathCloud Use for Students Collaboration Support *CEUR Workshop Proceedings* **1844** 327–39
- [37] Proskura S L and Lytvynova S H 2020 The approaches to Web-based education of computer science bachelors in higher education institutions *CEUR Workshop Proceedings* **2643**, 609–25
- [38] Semerikov S O, Teplytskyi I O, Yechkalo Yu V, Markova O M, Soloviev V N and Kiv A E 2019 Computer Simulation of Neural Networks Using Spreadsheets: Dr. Anderson, Welcome Back *CEUR Workshop Proceedings* **2393** 833–48
- [39] Shokaliuk S V, Bohunencko Ye Yu, Lovianova I V and Shyshkina M P 2020 Technologies of distance learning for programming basics on the principles of integrated development of key competences *CEUR Workshop Proceedings* **2643** 548–62
- [40] Spivakovskiy A, Petukhova L, Kotkova V and Yurchuk Yu 2019 Historical Approach to Modern Learning Environment *CEUR Workshop Proceedings* **2393** 1011–24
- [41] Striuk A M and Rassovytska M V 2014 The system of cloud oriented learning tools as an element of educational and scientific environment of high school *Information Technologies and Learning Tools* **42** 150–8 URL <https://doi.org/10.33407/itlt.v42i4.1087>
- [42] Trius Yu V, Solov'ev V N, Serdyuk O A and Piskun O V 2004 Regional educational portal as the main information resource for supporting continuous education and open learning *Upravlyayushchie Sistemy i Mashiny* (**4**) 74–81

- [43] Tryus Y V and Herasymenko I V 2021 Approaches, models, methods and means of training of future IT-specialists with the use of elements of dual education *Journal of Physics: Conference Series* In press
- [44] Unitech+ 2021 *Unitech+* URL <http://www.unitex.com.ua>
- [45] Vakaliuk T A, Spirin O M, Lobanchykova N M, Martseva L A, Novitska I V and Kontsedailo V V 2021 Features of distance learning of cloud technologies for the organization educational process in quarantine *Journal of Physics: Conference Series* In press
- [46] Vakaliuk T, Antoniuk D, Morozov A, Medvedieva M and Medvediev M 2020 Green IT as a tool for design cloud-oriented sustainable learning environment of a higher education institution *E3S Web of Conferences* **166** 10013 URL <https://doi.org/10.1051/e3sconf/202016610013>
- [47] Zelinska S O, Azaryan A A and Azaryan V A 2018 Investigation of Opportunities of the Practical Application of the Augmented Reality Technologies in the Information and Educative Environment for Mining Engineers Training in the Higher Education Establishment *CEUR Workshop Proceedings* **2257** 204–14
- [48] Zhaldak M I, Franchuk V M, Franchuk N P 2021 Some applications of cloud technologies in mathematical calculations *Journal of Physics: Conference Series* In press
- [49] Zhytomyr Polytechnic and Morozov A 2020 *Entrance to the electronic office of the student* URL <https://cabinet.ztu.edu.ua/>
- [50] Zhytomyr Polytechnic and Morozov A 2020 *Entrance to the electronic office of the teacher* URL <https://portal.ztu.edu.ua>
- [51] Zhytomyr Polytechnic State University 2020 *Educational portal* URL <https://learn.ztu.edu.ua/>